

# Internal drives - contents

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## Product Details

Write your tape drive details here so you can find them easily if you need them. The model name is on the front of the drive and the product and serial numbers are on a label on the bottom of the drive.

<b>Model (type of drive):</b>	
<b>Model (number):</b>	
<b>Serial (number):</b>	
<b>Date purchased/installed:</b>	
<b>SCSI ID:</b>	

# Before you start

The HP StorageWorks VS160 tape drive is a high-capacity, high-performance streaming tape drive. It is installed into a spare drive bay in your server. Before starting to install your tape drive, you should consider the following.

## Which operating systems are supported?

HP StorageWorks VS160 drives can be connected to servers running under Windows®. Refer to the “HP StorageWorks Tape Software Compatibility” topic on our World Wide Web site ([www.hp.com/go/connect](http://www.hp.com/go/connect)) for more information about the operating system versions that are supported.

## How do I connect the tape drive to my server's SCSI bus?

Your tape drive is attached to the SCSI bus of the host server via a spare connection on the internal SCSI ribbon cable. You will need a properly installed and configured SCSI host bus adapter (HBA) or a built-in SCSI controller on your server. For optimum performance your tape drive should be connected to an Ultra 160 or Ultra 320 host bus adapter or SCSI controller using a correctly terminated, LVDS-compatible ribbon cable with a spare 68-pin, high-density (HD), wide SCSI connector.

For most servers we recommend that you use the terminated SCSI ribbon cable supplied with the drive, see page 19. We also recommend that the drive is the only device on the SCSI bus. Do **not** connect more than two tape drives per SCSI controller. Do **not** attach the drive to the same SCSI bus as your disk drive or to a RAID controller, unless it is a ProLiant server with a Smart Array 6i RAID controller.

## Why is the SCSI bus type important?

The SCSI bus type determines the speed at which data can be transferred between devices on the bus and the maximum length of cable that can be used. HP StorageWorks VS160 tape drives are high performance Ultra 160 SCSI devices with a maximum burst transfer speed of 160 MB/second. To benefit from this level of performance, it is important to ensure that the drives are connected to a SCSI bus of a similar or higher specification. This means that you need:

- **An Ultra 160 or Ultra 320 SCSI bus.** Ultra 160 SCSI supports the maximum bus speed of 160 MB per second; Ultra 320 SCSI exceeds this.
- **LVD-rated SCSI cabling and terminators.** The LVD interface and cable supplied with the drive enable the data to be transferred at the drive's maximum rate and provide a maximum cable length of 12 meters.

If you attach the drive to a lower specification SCSI bus, it may still work, but data will not be transferred as quickly. For example, on a single-ended (SE) Ultra 2 SCSI bus the maximum burst transfer speed of the drive is 40 MB/second and the maximum cable length is restricted to 3 meters. See also Table 1, “supported SCSI bus types,” on page 9.

**Note** The drives are not compatible with high voltage differential (HVD) SCSI devices.

## How can I check the SCSI bus type?

We strongly recommend that you use HP Library & Tape Tools to check your server's current SCSI configuration. This will provide information about the SCSI bus and the SCSI IDs in use.

HP Library & Tape Tools is the recommended diagnostic and support tool for your HP tape storage product. It is available as a free download from the HP web site and is supported on nearly all major operating systems.

See [www.hp.com/support/tapetools](http://www.hp.com/support/tapetools) for compatibility information, updates and the latest version of the tool.

## What are the mounting requirements for the tape drive?

### Mounting bay

You need one industry standard, 5¼-inch, half-height bay in which to install the HP StorageWorks VS160 tape drive. Maximum power requirements are 2.1 A at 5 V and 2.7 A at 12 V.

### Mounting hardware

**Note** M3 screws are supplied with the tape drive to secure it to the mounting bay.

For many servers, no mounting tray or rails are required. Devices simply slide into the server's chassis and are fixed with screws. Other servers have built-in trays or rails. Rail kits for a number of industry-standard servers may be available. For more details refer to: [www.hp.com/go/connect](http://www.hp.com/go/connect).

Some servers use non-standard mounting rails and do not include spares. If this is the case with your system, you will have to order these accessories from the server manufacturer before you can install the tape drive.

### Air flow requirements

The server **must** provide forced cooling and be capable of drawing 3 cfm (0.08 m<sup>3</sup>/minute or 5.1 m<sup>3</sup>/hour) of air through the tape drive at 40° C ambient operation. Always operate the tape drive within an ambient air temperature of no more than 40° C.

It is important to keep the cooling holes in the rear and the grill in the front of the tape drive clear of any obstructions that may hinder the air flow and to ensure that all fans in your server are in place and operational. Make sure that empty bays have the appropriate blanking plates installed so that airflow is maintained.

## Do I need additional items for installation?

- You may need mounting hardware. See "What are the mounting requirements for the tape drive?" above.
- If you do not have a spare, suitably rated SCSI connector on your server, a new HBA (also known as a SCSI card) will be required. The SCSI bus rating should match or be higher than the SCSI rating of your tape drive. See Table 1, "supported SCSI bus types," on page 9 for recommended HBAs. For specific details relevant to your server model please refer to [www.hp.com/go/connect](http://www.hp.com/go/connect). You will need to purchase and install the new HBA into an unused, 64-bit PCI expansion slot within your server before installing your tape drive. (The kit can also be installed in a 32-bit PCI expansion slot, but performance may be degraded.)

Refer to our World Wide Web site for recommended products, configurations and ordering information: [www.hp.com/go/connect](http://www.hp.com/go/connect) or [www.hp.com/support/dlt](http://www.hp.com/support/dlt).

# Backup software and drivers

## Backup software

For optimum performance it is important to use a backup application that is appropriate for your system's configuration. In a direct attach environment, where the tape drive is attached to a standalone server, you can use backup software that is designed for a single server environment. In network configurations you will need backup software that supports enterprise environments. HP, Veritas, Legato, Yosemite and Computer Associates all provide suitable products. Further details about these and other products that may be appropriate can be found on our connectivity web site.

- 1 Go to our connectivity web site: [www.hp.com/go/connect](http://www.hp.com/go/connect) and select tape backup.
- 2 Select software compatibility.
- 3 Select your combination of operating system and tape drive model in the table. A list of supported backup applications is displayed.
- 4 Make sure you have a backup application that supports HP StorageWorks VS160 tape drives and download any upgrades or patches, if required.

## Drivers

### Windows users

After you connect the tape drive, download the HP driver from our web site: [www.hp.com/support](http://www.hp.com/support), see "Step 8: Verify installation" on page 23.

Refer to the accompanying README file for specific installation instructions for Windows 2000, Windows XP and Windows Server 2003 drivers.

**Note:** We recommend that you install drivers from the web rather than the Windows Hardware Installation Wizard, because the HP drivers fully support the performance of your tape drive.

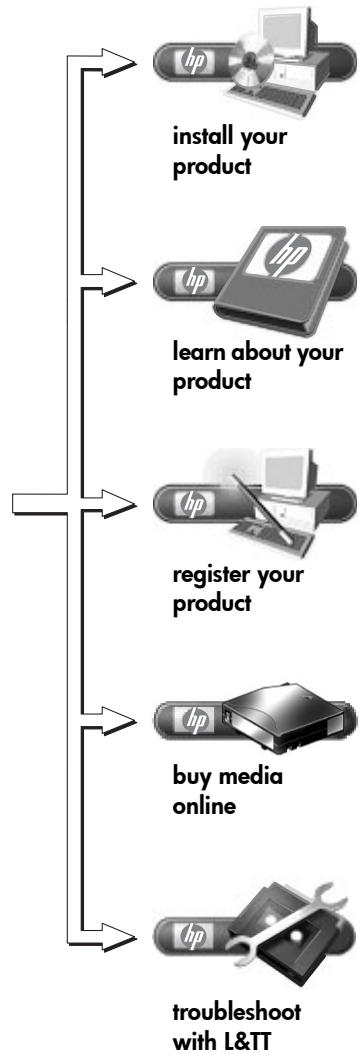


Figure 1: the *HP StorageWorks Tape* CD-ROM

# Using the CD-ROM

The *HP StorageWorks Tape* CD-ROM is a central source of information about your tape drive with utilities for getting the best performance from your tape drive.

Use the *HP StorageWorks Tape* CD-ROM to check installation, as described in this guide, and to verify and troubleshoot performance after installation. It helps you to:

- Install your product, which includes access to drivers, an installation check, and performance information and tools
- Learn about your product
- Register your product
- Buy media online
- Troubleshoot with HP Library & Tape Tools.

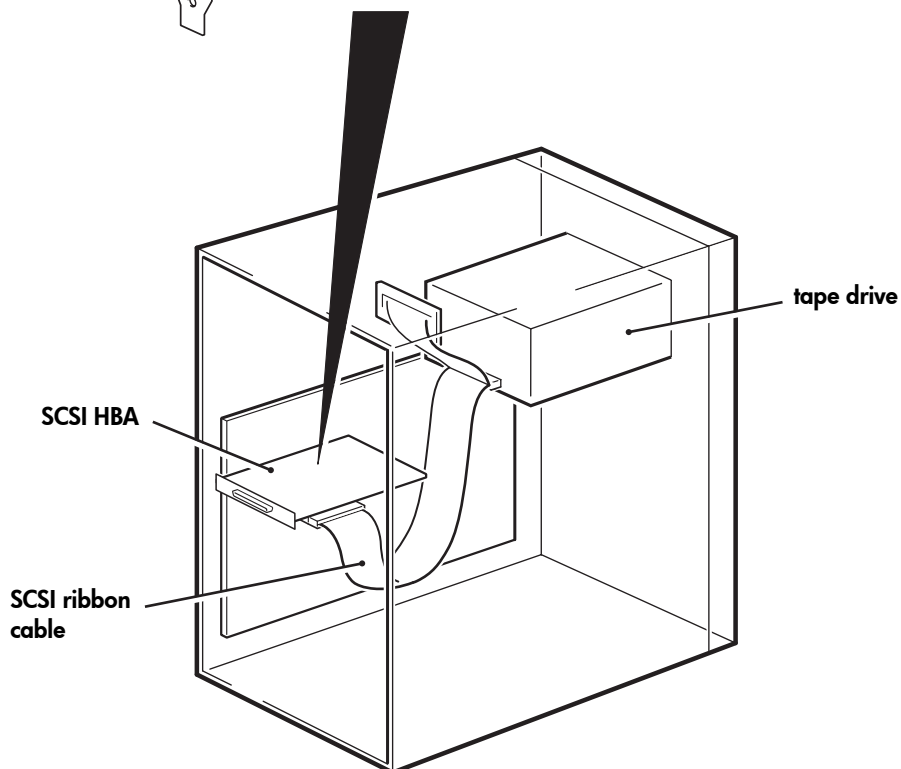
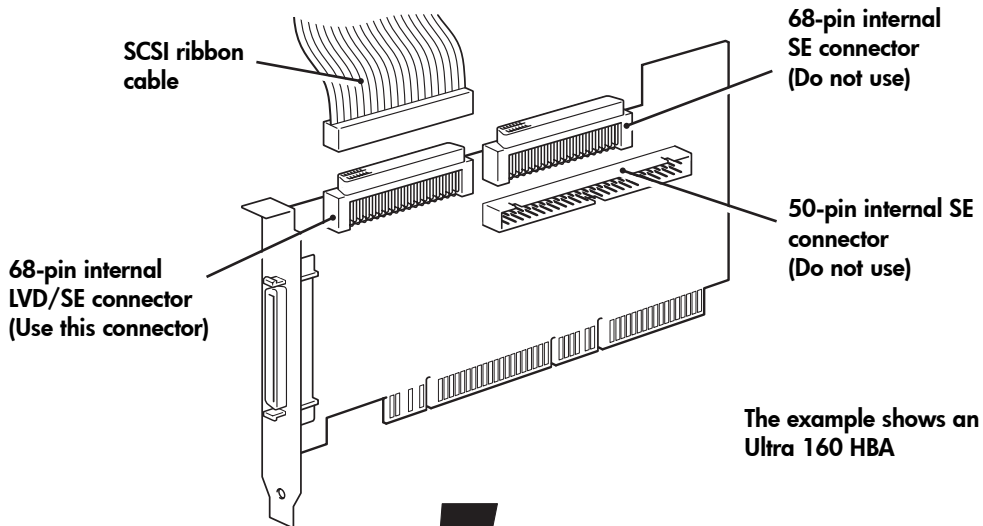
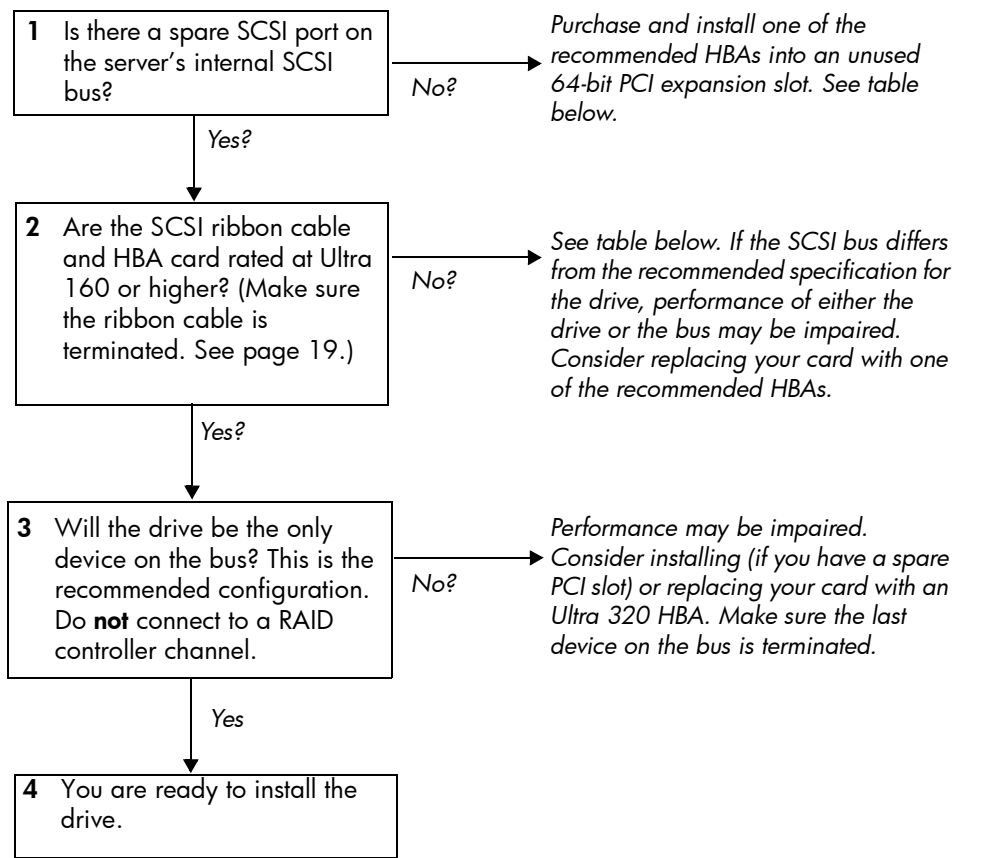


Figure 2: checking the SCSI connection



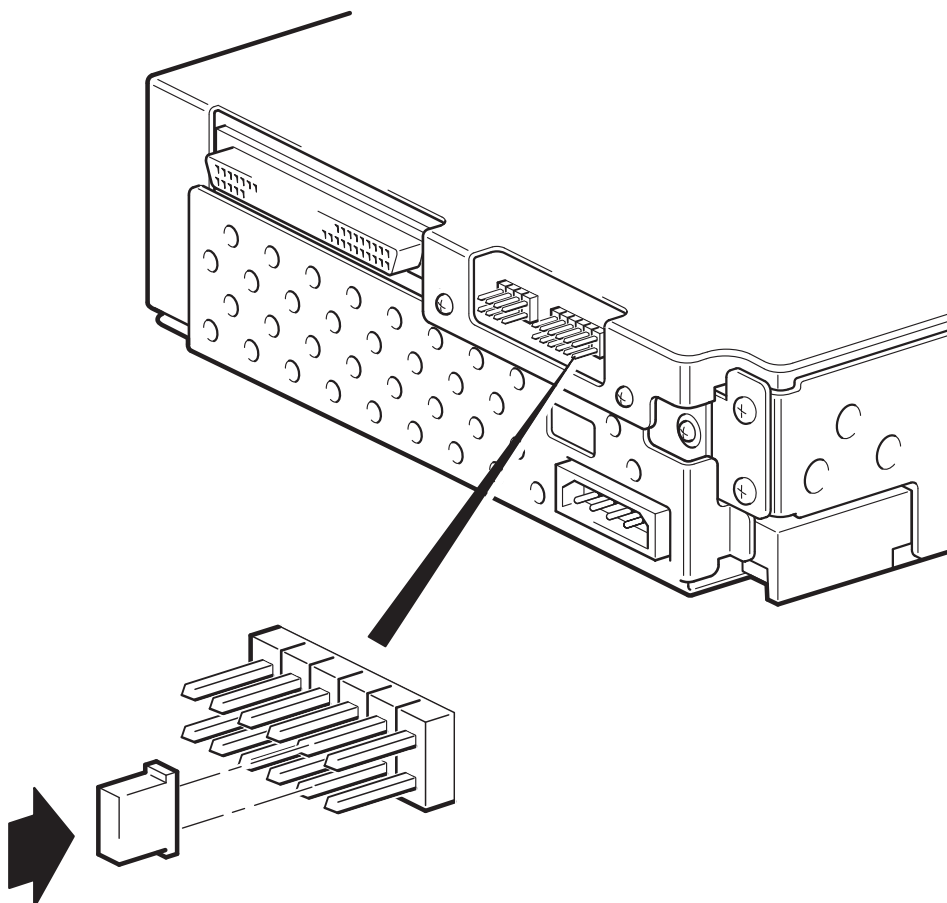
# Step 1: Check the SCSI connection

Use the following questions to help you check your SCSI connection. As long as you have a spare drive bay in your server you should have a spare connection on the internal SCSI bus. You need to ensure it is the correct SCSI bus type. Windows users can use HP Library & Tape Tools to check the SCSI bus type, see page 30. If you answer 'Yes' to all these questions, you are ready to install your tape drive. If you answer 'No', you will probably need to purchase and install additional items. For product details, go to [www.hp.com/go/connect](http://www.hp.com/go/connect).

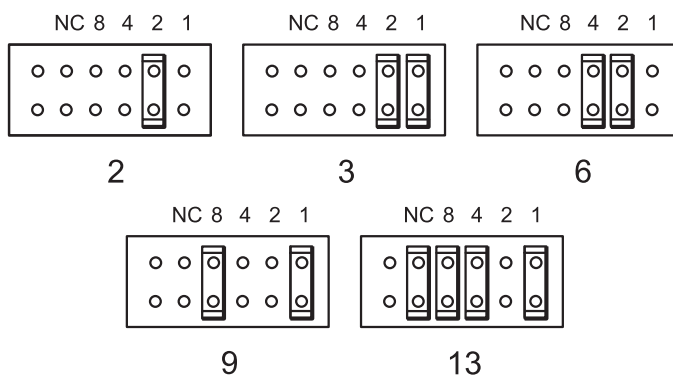


SCSI Bus Type	Transfer Speed	Supported
Ultra 160 LVD	Up to 160 MB/s	<b>Yes.</b> This is a <b>recommended</b> configuration.
Ultra 320 LVD	Up to 320 MB/s	<b>Yes.</b> This is a <b>recommended</b> configuration.
Ultra 2 LVD	Up to 80 MB/s	Yes, but this is <b>not</b> recommended
Ultra single-ended, wide	Up to 40 MB/s	Yes, but this is <b>not</b> recommended as it will restrict performance. Do <b>not</b> connect to a narrow SCSI bus.
High Voltage Differential	Up to 40 MB/s	No. The drive will not work and you may damage the drive or controller

table 1: supported SCSI bus types



**Example  
SCSI IDs**



**Figure 3: checking the SCSI ID**

## Step 2: Check the drive's SCSI ID

Your HP StorageWorks VS160 drive is shipped with a default SCSI ID of 6, but it can be assigned any *unused* ID between 0 and 15. Do not use SCSI ID 7, which is reserved for the SCSI controller. SCSI ID 0 is typically assigned to the boot disk and should also not be used unless the tape drive is on a dedicated SCSI bus.

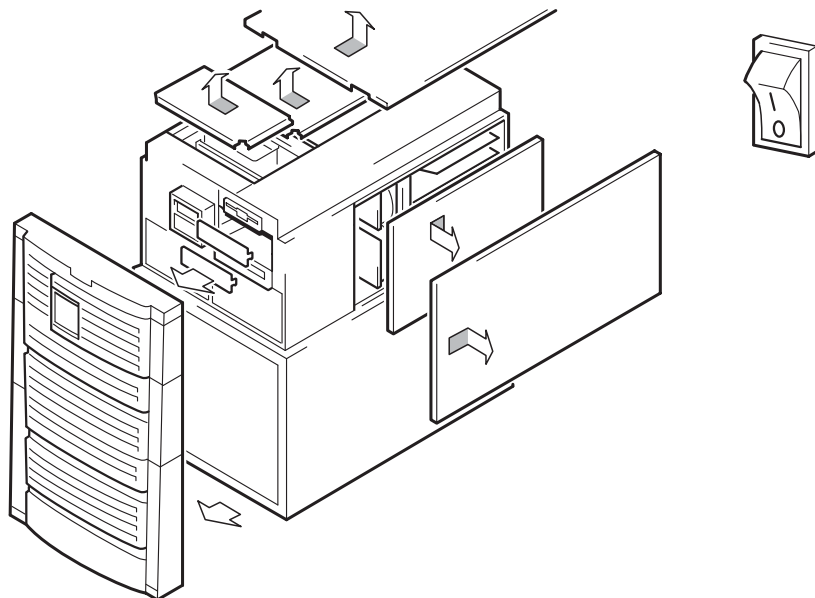
- 1 Determine whether you need to change the SCSI ID from the default of 6.

For most operating systems you can run HP Library & Tape Tools to check your computer's SCSI configuration. This will provide information about the SCSI bus and the SCSI IDs currently in use. See page 30.

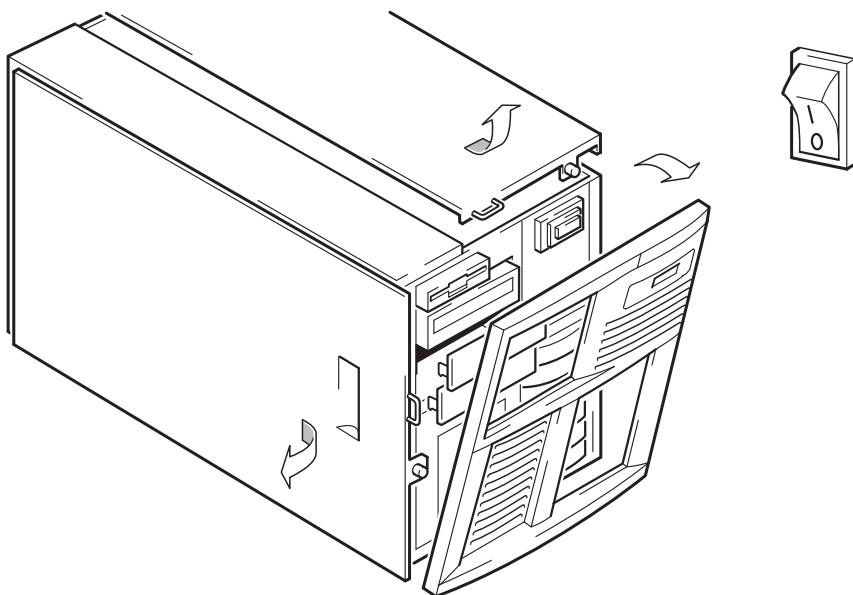
**Caution** Static electricity can damage electronic components. Always wear an antistatic wriststrap if possible. If not, to equalize the electromagnetic charges, touch a bare metal part of the server (such as the back plate) before you remove the tape drive from its bag.

- 2 Change the tape drive's SCSI ID, if necessary.

The SCSI ID is set using jumpers on a set of pins at the rear of the drive. Use tweezers or small pliers to move the jumpers to the pattern corresponding to the ID you want, see Figure 3. Spare jumpers are provided with the drive.



**Figure 4a: preparing mounting bay**



**Figure 4b: preparing mounting bay in a typical HP ProLiant server**

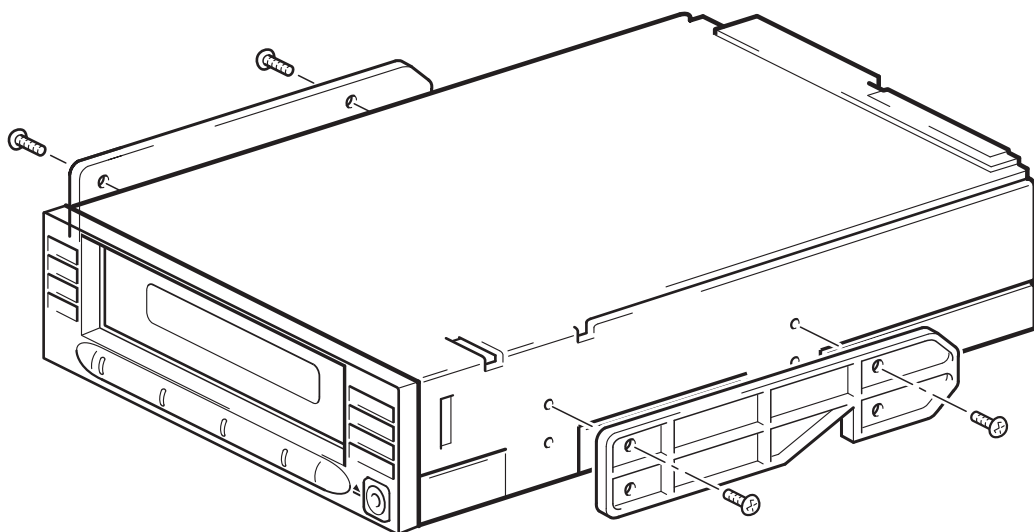
## Step 3: Prepare the mounting bay

**Warning** To avoid personal injury or damage to the server or tape drive, ensure that the server is disconnected from the mains power supply while you install the drive.

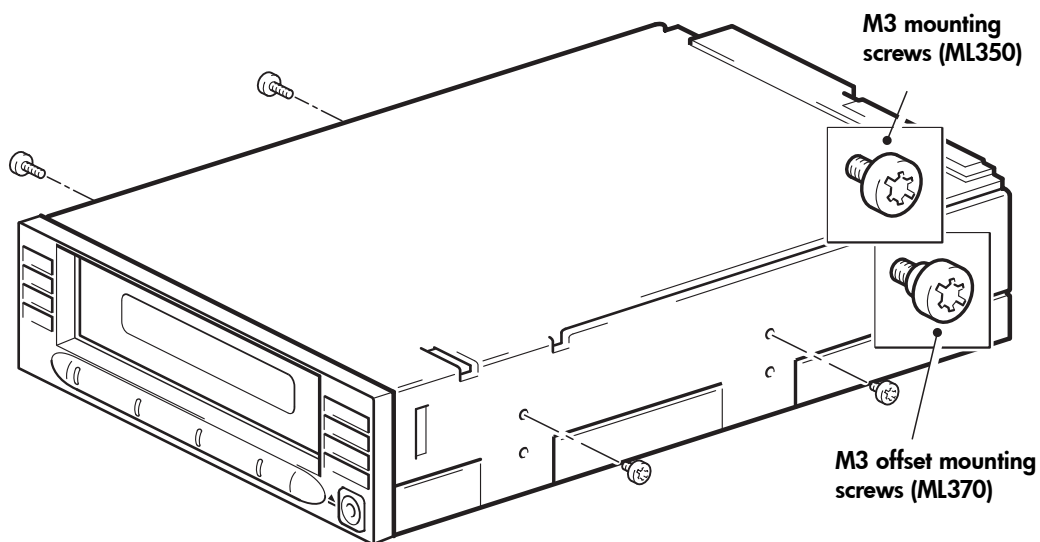
**Caution** Static electricity can damage electronic components. Always wear an antistatic wriststrap if one is available. If not, after you have disconnected power from the server and removed the cover, touch a bare metal part of the chassis. Similarly, touch a bare metal part of the drive before installing it.

- 1 Assemble the necessary tools and materials:
  - Phillips screwdriver
  - Flat-bladed screwdriver (if your server uses slotted screws)
  - Torx screwdriver (if your server uses torx screws)
  - Your server manuals (for reference during installation)
- 2 Perform a normal system shutdown and turn off the server and any connected peripherals. Disconnect all devices from the power supply.
- 3 Remove the cover and front panel from the server, as detailed in your server's documentation. As you work inside the server, you may have to disconnect the SCSI cable or power cable from other devices to maneuver the new drive into place. If you have to do this, make a note of their position and connections so you can put them back correctly later.
- 4 Remove the front filler panel from a spare, 5¼-inch bay of your server, as illustrated. With some servers, you must also remove the half-height device divider.

The internal tape drive requires adequate air flow to dissipate the heat resulting from continuous drive operation. The server must provide forced cooling and be capable of drawing 3 cfm (0.08 m<sup>3</sup>/minute or 5.1 m<sup>3</sup>/hour) of air through the tape drive at 40° C ambient operation. It is important to keep the cooling holes in the rear and the grill in the front of the tape drive clear of any obstructions that may hinder the air flow and to ensure that all fans in your server are in place and operational. Make sure that empty bays have the appropriate blanking plates installed so that airflow is maintained.



**Figure 5a: attaching mounting rails in a typical HP ProLiant 530 or 570 server**



**Figure 5b: attaching mounting screws in a typical HP ProLiant 350 or 370 server**

# Step 4: Attach mounting hardware

If your server requires special rails or other hardware to install the tape drive, mount them on the tape drive in this step.

*If your server does not require special mounting hardware, proceed to “Step 5: Install the drive” on page 17 now.*

## HP ProLiant servers

Different models of server require different mounting methods. The server may also incorporate a locking mechanism to hold the tape drive in place. See “Step 7: Secure the drive” on page 21.

Please check your HP ProLiant server documentation to ascertain the correct method of mounting, and to check whether mounting hardware is provided with the server.

### Mounting rails

Some HP ProLiant servers, such as ML530 and ML570, require mounting rails. These may be metal or plastic rails attached to the server's drive bay filler panel.

- 1 Use a regular Phillips screwdriver to attach the appropriate rails. Use the M3 screws provided with the tape drive, as shown in Figure 5a.

Ensure you do use the M3 screws provided - the rails may be attached to the filler panel by screws of a different thread/size type and these should not be used. If in doubt, refer to your HP ProLiant server documentation.

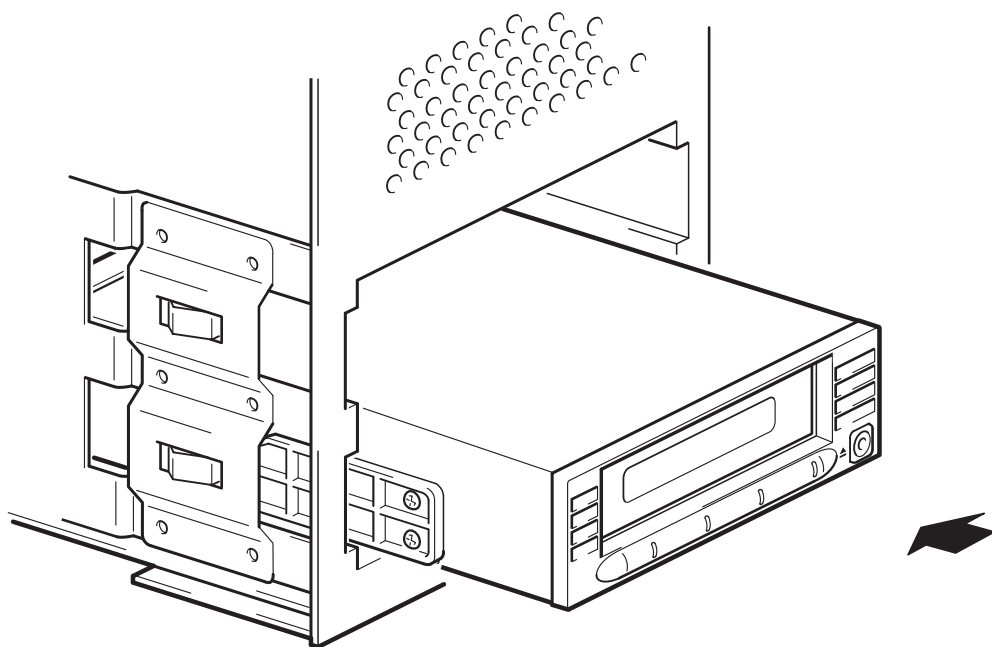
### Mounting screws

Other HP ProLiant server models, such as ML350 and ML370, only require the use of special locating screws with no mounting rail.

- 1 Use a T8 Torx screwdriver to attach the appropriate screws. You may need to purchase the M3 screws separately. Position the screws, as shown in Figure 5b.
  - HP ProLiant ML350: Use M3 mounting screws. These have a thicker head than the standard M3 screws.
  - HP ProLiant ML370: Use M3 offset mounting screws. These have a thick offset piece and a thicker head than the standard M3 screws.

## Other servers

Attach the appropriate mounting hardware. Refer to the manufacturer's documentation for instructions.



**Figure 6: installing the drive**



## Step 5: Install the drive

- 1 Slide the tape drive into the open bay, aligning the rails with the slots in the bay, as shown in Figure 6.

If your server does not use mounting hardware, check that the holes in the chassis are aligned with the holes in the side of the tape drive.

Do not secure the drive with screws at this point because you may have to move the drive to get the cables into place.

### Orientation

The internal tape drive may be installed top side up, left side down or right side down. Do **not** install it upside down. Check your server documentation to check what orientations it supports.

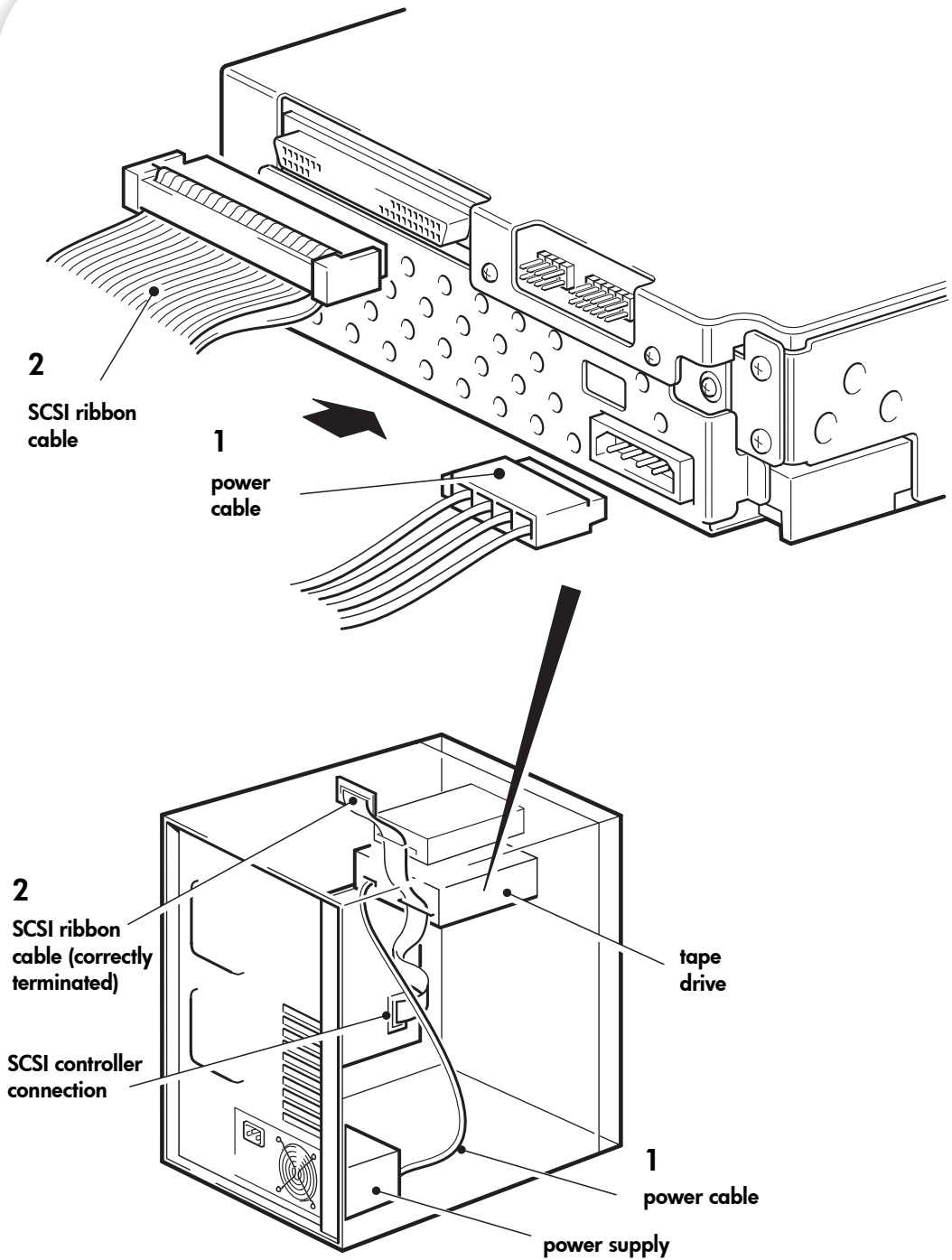


Figure 7: attaching power and SCSI cables

## Step 6: Attach power and SCSI cables

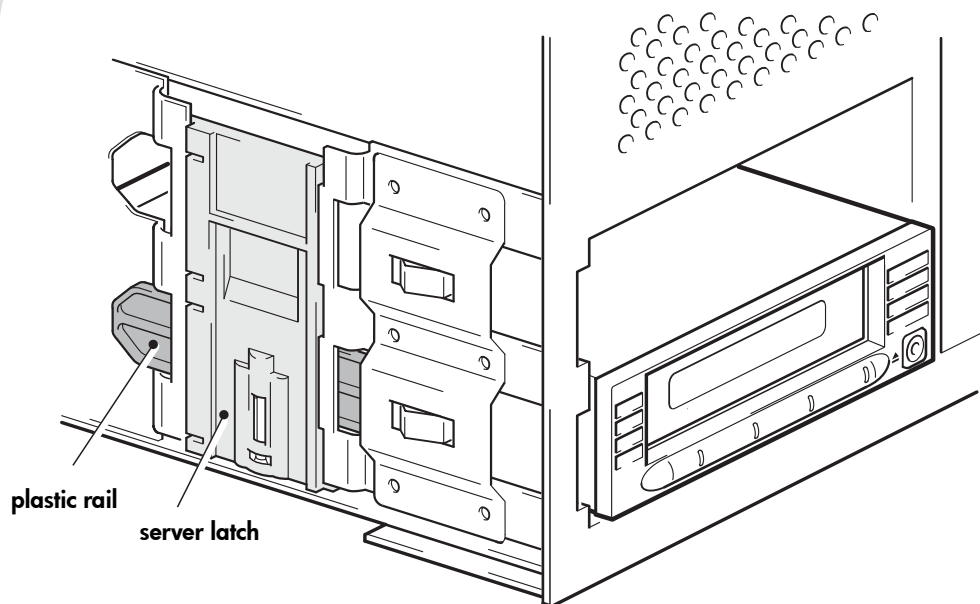
To support the high performance of the tape drive it is important to use a suitably-rated SCSI cable.

- 1 Check your server or HBA documentation to ensure that the SCSI bus and cabling supports up to Ultra 160 bus speeds. We recommend that you attach the SCSI ribbon cable supplied with the tape drive to the SCSI host bus adapter.
- 2 Attach a spare power cable from the server's internal power supply to the power connector, as shown in Figure 7, item 1.
- 3 Attach a spare connector on the server or HBA's SCSI ribbon cable to the SCSI connector of the drive, as shown in Figure 7, item 2.
- 4 If the drive is the last device on the SCSI chain, make sure that the SCSI cable is terminated correctly. (The cable supplied with the tape drive is terminated correctly.)

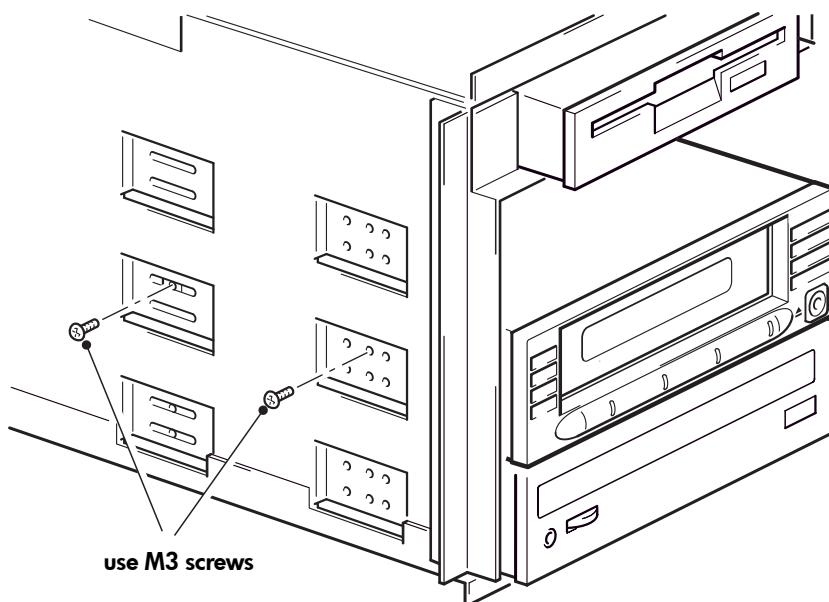
### Where should the SCSI terminator be?

Termination must be present at two and ONLY two positions on the SCSI bus—at the beginning of the SCSI bus and at the end of the SCSI bus. Termination is normally enabled by default on the HBA and most internal SCSI cables have a terminator attached. This will usually be a small, rectangular block of plastic attached to the cable end and marked 'SCSI Terminator'.

Therefore, assuming the HBA is the first device on the bus, you should check that the second terminator is placed after the last device, as shown in Figure 7, item 2.



**Figure 8a: securing drive to mounting hardware**



**Figure 8b: securing drive, no mounting hardware**

# Step 7: Secure the drive

The server latches and side views of your server model may not be exactly the same as shown in the illustrations. Please refer also to your server documentation.

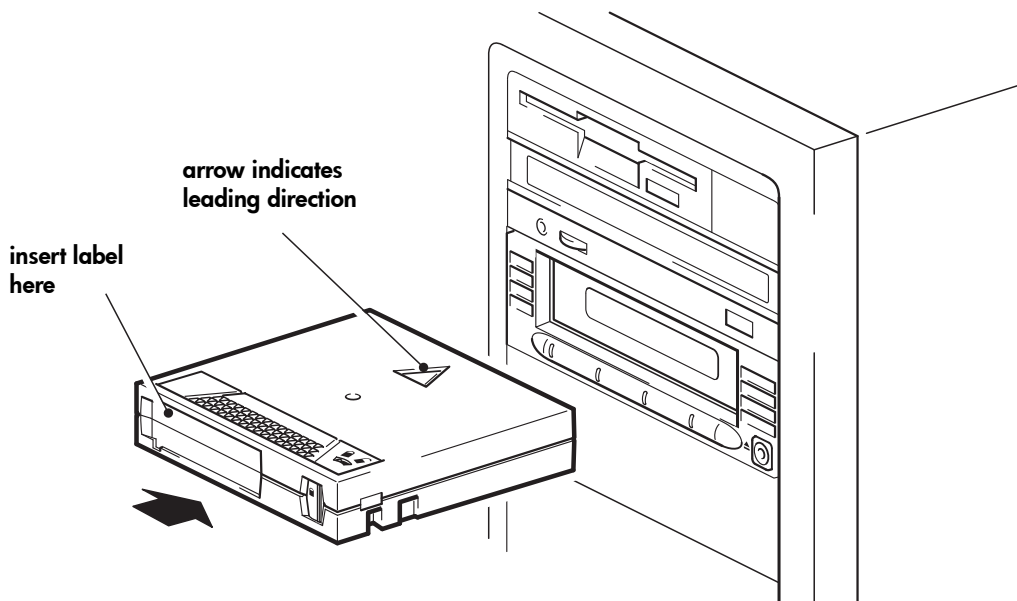
## Mounting hardware used (HP ProLiant)

Ensure that you use the correct mounting rails or locating screws, as described in “Step 4: Attach mounting hardware” on page 15. The server also incorporates a locking mechanism to hold the tape drive in place.

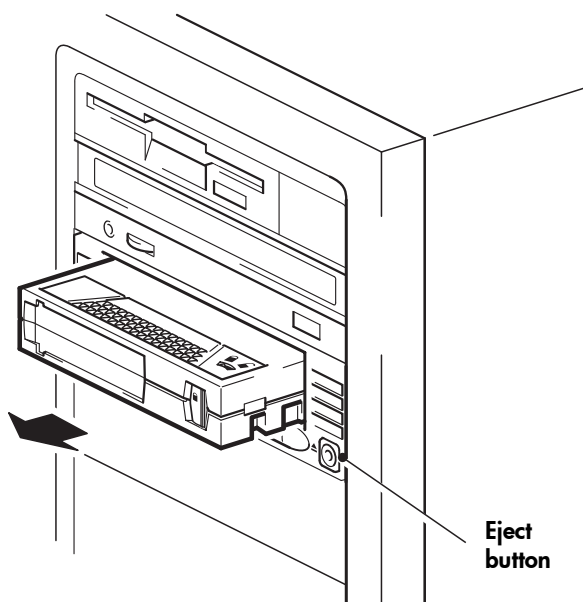
- 1 Push the server latch down to lock the tape drive into position, as shown in Figure 8a.
- 2 Replace the cover on the server.

## No mounting hardware used

- 1 Use the M3 screws provided with the tape drive to secure it in place. Check that the holes in the chassis are aligned with the holes in the sides of the drive and use a regular Phillips screwdriver to secure the M3 screws, as shown in Figure 8b.
- 2 Replace the cover on the server.



**Figure 9a: loading a cartridge**



**Figure 9b: unloading a cartridge**

# Step 8: Verify installation

## Check operation

- 1 Switch on the server. The tape drive will run its hardware self-test, which takes up to 25 seconds (with no cartridge loaded). If self-test passes, the Ready LED remains on and the other LEDs are off. See “Understanding the LEDs” on page 38 for more information about the LEDs.
- 2 Install drivers and backup software.  
On Windows systems, the Windows Hardware Installation wizard is displayed automatically. We recommend that you close the wizard and install the drivers from the HP web site at [www.hp.com](http://www.hp.com). For all operating systems ensure that you have downloaded any upgrades necessary for your backup application (see page 5).
- 3 Verify that the tape drive installation was successful.  
For most operating systems use HP Library & Tape Tools as described on page 30.  
If you encounter a problem during this verification procedure, turn to “Troubleshooting” on page 33 for help in diagnosing and fixing the problem.
- 4 You are now ready to carry out a backup and restore test to check that the drive can write data to tape. Use a blank DLTape VS1 cartridge. See “Use the correct media” on page 27 for more information about recommended cartridges. Refer to your backup application documentation for specific instructions.

## To load a cartridge

- 1 Insert the DLTape VS1 cartridge into the slot in front of the drive with the markings uppermost and facing the drive door. Apply gentle pressure until the drive takes the cartridge and loads it. See Figure 9a.
- 2 The Ready LED flashes green while the drive performs its load sequence. When the cartridge is ready for use, the Ready LED shows steady green. (If the Media LED is also on, you have used a DLTape 1V (VS80) cartridge. See “Use the correct media” on page 27.)

## To unload a cartridge

**Caution** Never try to remove a cartridge before it is fully ejected or power off the tape drive while a cartridge is still loaded. Failure to remove a data cartridge may result in cartridge or tape drive damage.

- 1 Press the Eject button on the front panel. (See Figure 9b.)
- 2 The drive will complete its current task, rewind the tape to the beginning, and eject the cartridge. The Ready LED will flash to indicate that the unload is still in progress and will show steady green, when the cartridge is ready for removal.

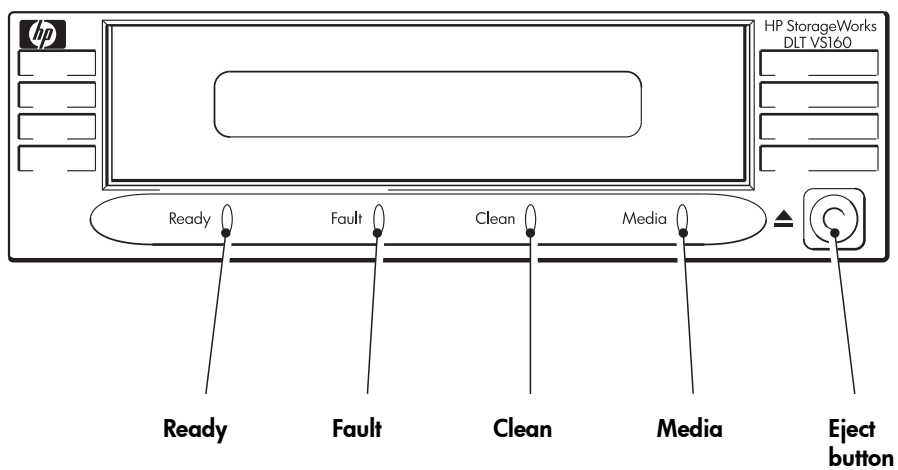


Figure 10: tape drive controls and indicators



# Your HP StorageWorks VS160 tape drive

Your HP StorageWorks VS160 tape drive has four LEDs (light emitting diodes) on the front panel which indicate drive status, and an eject button. The LEDs provide useful troubleshooting information. See also “Understanding the LEDs” on page 38. See page 23 for more information about using the eject button in normal operation.

## Front panel LEDs

There are four LEDs as illustrated in the diagram. (See Figure 10.)

### **Ready - far left, green**

- On, green: power is on and the drive is ready for use
- On, blinking: the drive is busy
- Off: no power to the tape drive

### **Fault - left, amber**

- On: internal firmware error
- Slow blink (1 per second): user-initiated write/read diagnostic failed
- Fast blink (3 per second): servo or mechanism error

### **Clean - right, amber**

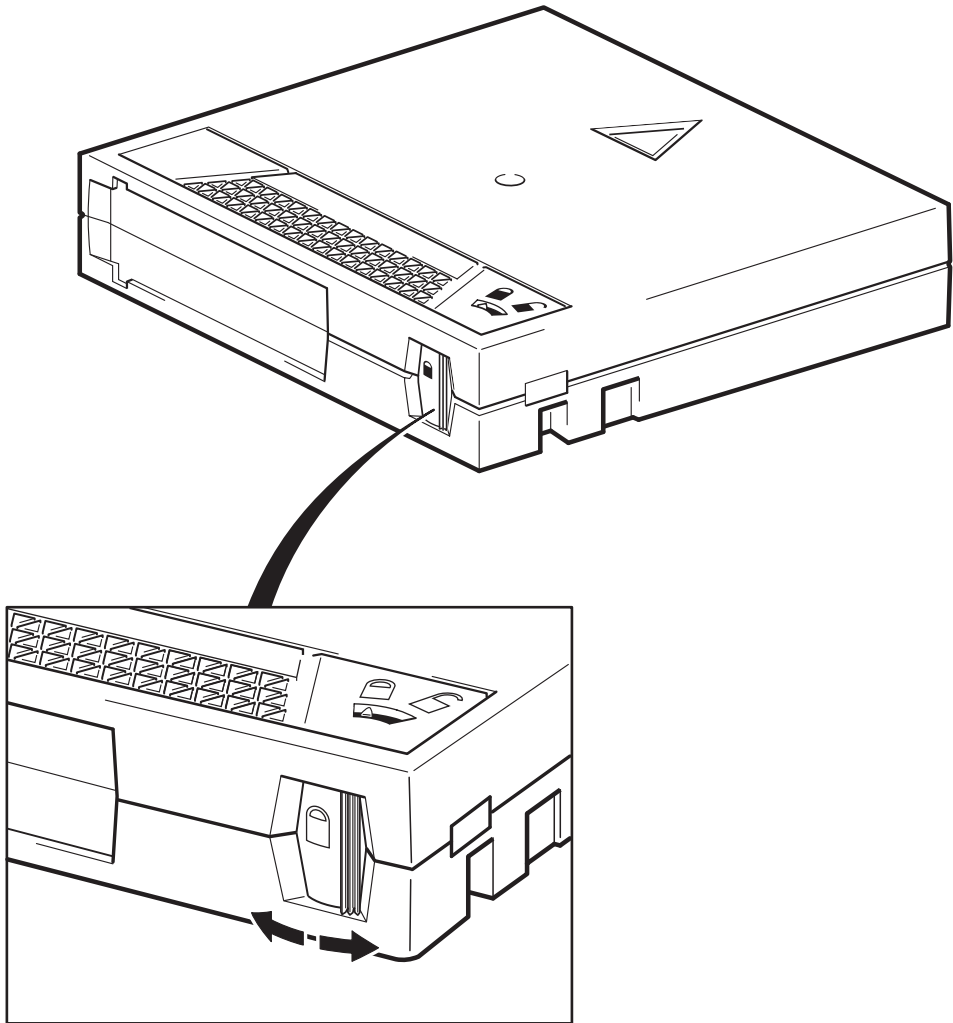
- On: cleaning is required
- Medium blink (2 per second): cleaning in progress
- Slow blink (1 per second): calibration error or permanent write/read error

### **Media - far right, green**

- On: DLT1 (VS80) format DLTtape IV cartridge loaded (you can read, but not write to, this cartridge)
- Slow blink: unsupported format or damaged cartridge

## Eject button

Use the eject button to eject the tape cartridge from the drive. When you press the button, the drive completes any active writing of data to the tape, then ejects the cartridge. You can also use the eject button to perform an emergency reset or to put the drive into code update mode, see “Unload/Eject Button Functions” on page 41.



**Figure 11: write-protecting cartridges**

# Use the correct media

For best performance we recommend HP branded media. Order online at: [www.hp.com/go/storagemedia](http://www.hp.com/go/storagemedia). If you do not have internet access, refer to the User's Guide on the *HP StorageWorks Tape* CD-ROM for ordering information for tape cartridges and cleaning cartridges.

## Data cartridges

**Note** \* All values assume 2:1 compression.

Always use HP DLTape VS1 160 GB\* tape cartridges with your tape drive. These are single-reel cartridges that match your drive's format and are optimized for high capacity, throughput and reliability.

Your DLT VS160 tape drive can read, but not write, DLTape IV data cartridges previously written with the DLT1/VS80 format. It is not compatible with any other DLT or SDLT tape formats. The Media LED blinks as the tape drive attempts to load an unsupported cartridge and, when the tape load process fails, the tape drive ejects the cartridge.

Type of cartridge	Capacity	Compatibility
DLTape VSI	160 GB*	Read/Write
DLTape IV (DLT1/VS80 format)	80 GB*	Read Only
All other cartridges	Not compatible. The drive ejects degaussed or cartridges written in any of the following types: DLT III, DLT IIIXT, DLT IV (except for cartridges written in VS80 format), SDLT I and SDLT II	

**table 2: DLT VS160 data cartridge compatibility**

**Note** If your cartridge is ejected within a minute after loading, you have used the wrong media format or the cartridge is damaged.

## Write-protecting cartridges

If you want to protect the data on a cartridge from being altered or overwritten, you can write-protect the cartridge.

If you move the write-protect switch during operation, the write-protect feature does not take effect until after the current write operation completes.

- To write-protect a cartridge, slide the switch to the right. A “locked” icon appears on the switch, indicating that the cartridge is protected.
- To write-enable a cartridge, slide the switch to the left. The “unlocked” icon appears on the switch.

The indicator on the top of the data cartridge also points to the appropriate icon, indicating the write-protected status. Figure 11 illustrates the location of the write-protect switch and indicator.

Write-protection will not prevent a cartridge being erased by bulk-erasure or degaussing.

## Cleaning cartridges

You must use DLT VS160 CleaningTape with HP StorageWorks VS160 tape drives. Most other cleaning cartridges, such as CleaningTape III, will be ejected.

**Caution** Do not use other format cartridges in your tape drive and do not use DLT VS160 CleaningTape cartridges in other format tape drives.

### To clean the tape drive:

A DLT VS160 CleaningTape cartridge should only be used when the Clean LED is constantly lit or when your backup software notifies you that the tape drive needs cleaning. Do not clean the tape drive unless the tape drive specifically indicates cleaning is necessary.

For ordering information see [www.hp.com/go/storagemedia](http://www.hp.com/go/storagemedia).

- 1 Insert the DLT VS160 CleaningTape cartridge, with the Front Slide Label Slot facing outward.
- 2 The drive will carry out its cleaning cycle and eject the cartridge on completion, which can take between 1 (the first time that the cartridge is used) and 10 minutes (the 20<sup>th</sup> time that the cartridge is used). During the cleaning cycle the Clean LED will blink rapidly.

Each DLT VS160 CleaningTape cartridge can be used up to 20 times. The cleaning cartridge includes a label with 20 small boxes printed on it. Place a check mark in one of the boxes each time you use the cleaning cartridge to clean the drive. Replace the cleaning cartridge when you have checked all the boxes. If the cartridge has expired, it will not clean; it does not eject.

## Looking after cartridges

It is important that you look after your HP media and adhere to the recommended guidelines. See "Problems with cartridges" on page 42.

**Caution** You may damage the tape drive if you try to insert and load a damaged cartridge. If you have dropped the cartridge or suspect it may be damaged, please inspect it carefully and discard it, if necessary.

# Register your tape drive

Once you have installed and tested your HP StorageWorks VS160 tape drive, please take a few minutes to register your product. You can register via the web at [www.register.hp.com](http://www.register.hp.com).

To ensure your registration is complete, there are a number of questions on the electronic form that are mandatory. Other questions are optional. However, the more you feel able to complete, the better we can meet your needs.

**Note** HP and its subsidiaries are committed to respecting and protecting your privacy. For further information, please visit our World Wide Web site ([www.hp.com](http://www.hp.com)) and click on Privacy Statement.

# Diagnostic tools

## HP Library & Tape Tools

HP StorageWorks Library & Tape Tools is the recommended diagnostic and support tool for your HP tape storage product. It is available from a link on the CD shipped with your product or as a free download from the HP web site. It is supported on nearly all major operating systems.

See [www.hp.com/support/tapetools](http://www.hp.com/support/tapetools) for compatibility information, updates and the latest version of the tool.

**Note** HP Support will also request that you use Library & Tape Tools should you need to contact them in the future, so it is a good idea to have it installed.

### Troubleshooting with Library & Tape Tools

When Library & Tape Tools is first run, it will scan for HP tape drives and libraries on your system and ask you to select the one to work with. At this time you can see the HBA configuration of your server, how your devices are connected and the SCSI IDs of those devices.

Once you have selected your device you have a number of choices for troubleshooting.

- Device identification: shows part number, serial number and information about any cartridge loaded
- Firmware upgrade: allows you to locate and upgrade to the latest firmware. You will need to be connected to the internet for this.
- Run tests: allows you to run proactive tests on your drive, such as the drive assessment test, which will verify the functionality of your drive in around 20 minutes. HP recommends running this test before calling HP Support. You will need to provide a 'trusted' cartridge that can be written to during this test.
- Generate a support ticket: this is a full dump of the drive logs along with interpretation and is used by HP Support to learn about the condition of your drive. Most useful is the device analysis section which is the output from approximately 20 rules forming a comprehensive analysis of the health of your drive. These rules may give advice such as cleaning the head or trying a different tape if issues are found. The support ticket can be sent to HP Support for further analysis.
- Run the performance tests: the tests to measure the write/read performance of your tape drive and the data generation rates of your disk subsystem are also integrated into Library & Tape Tools. Use these tests to find the performance bottleneck in your system.

# Optimizing performance

We strongly recommend that you check the information on our web site at [www.hp.com/support/pat](http://www.hp.com/support/pat). This contains detailed support information that will enable you to identify bottlenecks and take full advantage of the performance capabilities of the DLT VS160 tape drive.

Various factors can affect tape drive performance, particularly in a network environment or if the drive is not on a dedicated SCSI bus. If your tape drive is not performing as well as expected—for example, if backup windows are longer than expected—consider the following points before contacting HP Support at [www.hp.com/support](http://www.hp.com/support).

## Is the tape drive on a dedicated SCSI bus?

For optimum performance, we recommend that the tape drive is the only device on the SCSI bus. If it is not, ensure other devices are LVD-compliant. If they are single-ended, the bus will switch to single-ended mode with a lower transfer speed. There will also be restrictions on cable length.

## Can your system deliver the required performance?

The HP StorageWorks VS160 tape drive can write uncompressed data at up to 8 MB/s (28.8 GB/hour) or compressed data at up to 16 MB/s (57.6 GB/hour), assuming 2:1 compression. However, to get this performance it is essential that your whole system can deliver this performance. In most cases, the backup application will provide details of the average time taken at the end of the backup.

Typical areas where bottlenecks can occur are:

- **Disk subsystem**  
A single spindle disk may not be able to deliver good data throughput at poor compression ratios. Best practice to ensure good throughput is to utilize multiple disk spindles or data sources.
- **System architecture**  
Be aware of the architecture of your data protection environment; the aggregation of multiple client sources over a network provides a good way of delivering good performance, but anything less than Gigabit Ethernet may limit performance. Some enterprise class backup applications can be made to interleave data from multiple sources, such as clients or disks, to keep the tape drive working at optimum performance.
- **Tape media type**  
The data cartridge should match the specification of the tape drive. A lower specification will have a lower transfer speed (see “Data cartridges” on page 27). Use DLT VS1 160 GB cartridges.

- **Data and file types**

The type of data being backed up or restored can affect performance. Typically, small files incur greater overhead in processing and access than large files. Equally, data that is not compressible will always limit the speed at which the drive can write/read data. You will achieve no more than native rates with uncompressible data.

Examples of files that compress well are plain text files, spreadsheets; those that compress poorly are those that are either compressed as part of their format (such as, JPEG photographic files) or stored as compressed (such as, .ZIP files or .gz/.Z files on Unix platforms).



# Troubleshooting

The first step in problem-solving is establishing whether the problem lies with the cartridge, the drive, the host server and its connections, or with the way the system is being operated.

Most modern SCSI host bus adapters locate and display attached devices when the system is booting up. On Windows systems, if you swap or connect a product when your system is running, you will need to reboot the system. IA32 systems also usually need to be rebooted.

If the device is not detected on boot up, there is probably a problem with the physical hardware: cables, termination, connections, power or the host bus adapter itself. If the device is displayed during boot up but cannot be found in the operating system, this is more likely to be a software problem.

- If you encounter a problem during installation and need further clarification, refer to the “Problems encountered during installation” on page 34.
- If a problem arises during testing after you have installed the drive, refer to the symptom-based section “Testing after installation” on page 36.
- For more information about LED sequences, refer to “Understanding the LEDs” on page 38.
- For information about cartridges, refer to “Problems with cartridges” on page 42.

You can use HP Library & Tape Tools to help diagnose problems, see “HP Library & Tape Tools” on page 30.

## Web troubleshooting guide

Please refer also to the detailed troubleshooting guide on the web at [www.hp.com/go/support](http://www.hp.com/go/support). This contains the most comprehensive and up-to-date troubleshooting information.

## Problems encountered during installation

### *Unpacking*

Description	Further information
Some parts appear to be missing or damaged.	Contact your vendor if any parts need replacing.

### *The screws or mounting hardware are not suitable for the server*

Description	Further information
Additional parts may be required for fitting the tape drive into the server.	The HP StorageWorks VS160 internal tape drive will fit into most servers without the need for additional hardware other than that originally shipped with your system. If additional parts are required, or the original parts have been lost, contact your server vendor. See "Step 4: Attach mounting hardware" on page 15.

### *It is unclear which SCSI ID to use*

Description	Further information
It is uncertain which ID numbers are available.	Use HP Library & Tape Tools (see page 30) to provide information on your current SCSI settings. You can also normally check the SCSI configuration from the boot-up screen or from the Windows Control Panel. The HP StorageWorks VS160 drive has its SCSI ID set to 6 by default. This should be left unchanged unless this number is already in use. Full instructions on how to change the SCSI ID are given on page 11.

### *How should the SCSI bus be terminated?*

Description	Further information
It is unclear if the bus is already terminated or where an additional terminator should be placed.	Both ends of a SCSI bus must be terminated. Typically, when connecting an internal drive to the ribbon cable already inside your server then both the host bus adapter and the end of the ribbon cable will already be terminated and no further action is required. The ribbon cable supplied with the tape drive is terminated correctly.

### ***Is the correct SCSI host bus adapter installed?***

<b>Description</b>	<b>Further information</b>
The server already has a SCSI host bus adapter but it is difficult to determine what type it is.	If your server is in its original configuration (no SCSI adapters have been added or removed) then use <a href="http://www.hp.com/go/connect">www.hp.com/go/connect</a> to check the compatibility of your system. You can also check the SCSI configuration from the boot-up screen or from the Windows Control Panel, or by using HP Library & Tape Tools (see page 30).
The server may not have a SCSI host bus adapter installed.	Use HP Library & Tape Tools (see page 30) to check whether you have a SCSI host adapter on your system. If not, you will need to purchase one.

### ***Do drivers need to be installed and, if so, which ones***

<b>Description</b>	<b>Further information</b>
It is unclear whether there is a need to install drivers onto the system and more help is required.	Detailed information specific to your system can be found on the <a href="http://www.hp.com/go/connect">www.hp.com/go/connect</a> web site. Drivers can be obtained from <a href="http://www.hp.com/support">www.hp.com/support</a> . (Backup software that states support for HP StorageWorks VS160 tape drives also provides the required drivers.)
The required drivers do not appear to be available.	Future drivers will be provided via the support web site when they become available.

## Testing after installation

Remember that the system recognizes devices during boot-up. If you swap or connect a product when your system is running, you will need to reboot the system. Rebooting the system will reset devices and will often resolve problems. It is good practice to reboot every time you add a driver or install firmware.

**Caution** Never power off the drive while a cartridge is still loaded or during a firmware upgrade.

### *The server does not reboot after installation*

Possible reason	Recommended action
You have installed an additional SCSI host bus adapter and its resources are clashing with an existing adapter.	Remove the new host bus adapter and check the server documentation.
You have disconnected the power or SCSI cable from the server's boot disk during the drive installation process.	Check that the cables to all devices are firmly connected.

### *The server boots but does not recognize the tape drive*

Possible reason	Recommended action
The power or SCSI cable is not connected properly.	Check that the cables to the tape drive are firmly connected. Ensure that the SCSI cable is LVDS-compliant and does not have any bent pins. Replace, if necessary.
The SCSI bus is not terminated correctly.	Check that the SCSI bus is actively terminated. (Refer also to the documentation for your SCSI controller and any other SCSI devices you may have.)
The tape drive's SCSI ID address is not unique.	Make sure that each device on the SCSI bus has a unique ID. We recommend that the tape drive is connected to a dedicated host bus adapter. Do not attach the drive to the same SCSI bus as your disk drive, or to a RAID controller, unless it is a ProLiant server with a Smart Array 6i RAID controller.

### ***The application does not recognize the tape drive***

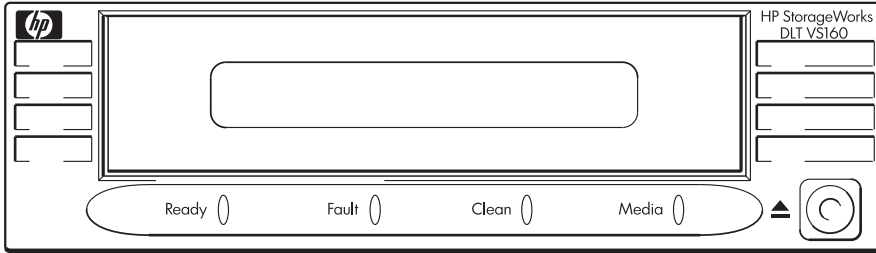
<b>Possible reason</b>	<b>Recommended action</b>
The application does not support the tape drive.	Use HP Library & Tape Tools to check that the drive is installed properly. Refer to our World Wide Web site ( <a href="http://www.hp.com/go/connect">www.hp.com/go/connect</a> ) for details of backup applications that support the HP StorageWorks VS160 tape drive. Load any service packs as necessary.
Some applications require drivers to be loaded.	Check that the correct SCSI and tape drive drivers are installed. Consult the backup application's installation notes for details.

### ***The drive does not work***

<b>Possible reason</b>	<b>Recommended action</b>
If the drive does not power up (all LEDs are off), the power cable may not be connected to the drive properly.	Make sure that the power cable is firmly connected. If it is, try another power connector. If the drive still does not power up, call for assistance.
If the self-test fails (see "LEDs during self-test" on page 38), there may be a hardware or firmware failure.	If there is a cartridge in the drive, remove it. Power down the drive and power it up again. Try another power connector. If the self-test still fails, call for assistance.

# Understanding the LEDs

## LEDs during self-test



Your HP StorageWorks VS160 tape drive has four LEDs (light emitting diodes) on the front panel, which indicate drive status. The desktop model also has a green Power LED. These LEDs provide useful troubleshooting information.




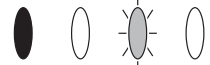


The tape drive performs a power-on self-test whenever power is applied. The test takes between 25 seconds (no cartridge loaded) and several minutes (cartridge loaded).


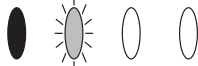
- The LEDs illuminate one at a time, from left to right, starting with the Ready LED, next the Fault LED, and finally the Clean LED, at approximately one second intervals.
- The Media LED illuminates very briefly and then all the LEDs go off. The Ready LED then blinks for 10 to 15 seconds.
- If a data cartridge is not loaded, the Ready LED illuminates and POST is complete, the entire process taking approximately 25 seconds.
- If a data cartridge is loaded, the Ready LED flashes while the tape drive mounts the data cartridge, a process that can take several minutes.
- As POST completes, the tape drive makes a slight buzzing noise for several seconds. This noise is normal.
- The tape drive is now ready to use.

## Using the LEDs for troubleshooting

If you cannot resolve a problem, contact customer service at [www.hp.com/support](http://www.hp.com/support).

Use the following table to interpret the front panel LED sequences and the appropriate action to take, if any.

LED Sequence and Cause	Action required
 <i>All LEDs OFF.</i> Drive may not have power, may be faulty or may have been power cycled or reset during a firmware upgrade.	Make sure the server is switched on. If the power supply is present and all LEDs remain off, power cycle the server. Check the internal power cable connection and replace the cable if necessary. If there is still no power, call for service.
 <i>Media blinking slowly</i> The drive believes the current tape or the tape just ejected is faulty.	Make sure that you are using the correct format cartridge; a DLT VS1 data cartridge for read and write or a DLT I /VS80 format for read only, or a DLT VS160 cleaning cartridge. (See also page 27.) Check the cartridge for damage. Load a new or known-good cartridge. If the Media LED is still on, call for service.
 <i>Media ON</i> A DLT1 (VS80) format DLTtape IV™ data cartridge is loaded.	Your tape drive can read, but not write to, this data cartridge. If you attempt to write to the cartridge, your backup application will return a "Write Protected" message.
 <i>Clean blinking slowly.</i> The tape drive cannot read the calibration tracks on the media or has encountered a permanent write or read error.	If the failure is the result of a calibration error, the tape drive ejects the data cartridge. If the failure is the result of a permanent read/write error, the tape drive does not eject the data cartridge. Try a known-good data cartridge. If the condition persists with a particular data cartridge, discard or degauss that data cartridge. If this error is repeatable with a known-good data cartridge, try cleaning the tape drive. If cleaning the tape drive does not help, contact Support.
 <i>Clean blinking rapidly.</i> Cleaning in progress.	This is normal. Wait for cleaning to complete.
 <i>Clean ON</i> Cleaning is required.	The tape drive continues to function, although you may encounter more soft error rates. Clean your tape drive as soon as possible.

LED Sequence and Cause	Action required
 <i>Fault ON.</i> Internal firmware error.	Power cycle or reset the tape drive. Try the operation again with a known-good data cartridge. If the condition persists, contact Support.
 <i>Fault blinking rapidly</i> Servo or mechanical error.	Power cycle or reset the tape drive. Try the operation again with a known-good data cartridge. If this condition persists with a known-good data cartridge, contact Support.



# Unload/Eject Button Functions

## Normal Unload/Eject

When you press and release the button within 6 seconds, the tape drive unloads and ejects the data cartridge.

## Emergency Reset



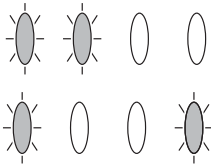
Hold the Eject button for 27 to 30 seconds and release it when all four LEDs are on solidly.

The tape drive performs a hard reset, behaving as if it has been powered off and then on. A standard POST then occurs.

## Enter Code Update Mode

If you have a firmware upgrade cartridge with a code level higher than the tape drive, the drive recognizes this when it reads the cartridge and automatically loads the update. However, you can also manually update the firmware, for example, if you want to revert to a specific firmware version.

**Note** We recommend that you use HP Library & Tape Tools for all firmware and software downloads.



1. Hold down the Eject button for 9 to 12 seconds and release it when the first two LEDs (Ready and Fault) blink.
2. When the two outer LEDs (Ready and Media) blink, the tape drive is ready to accept a code update data cartridge.
3. Insert the code update data cartridge within 15 seconds to update the firmware inside the tape drive. If you do not load a code update data cartridge within 15 seconds, the tape drive returns to normal operating mode.

# Problems with cartridges

If you experience any problems using HP branded cartridges, check:

- The cartridge case is intact and that it contains no splits, cracks or damage.
- The cartridge has been stored at the correct temperature and humidity. This prevents condensation.
- The write-protect switch is fully operational. It should move from side to side with a positive click.
- The World Wide Web site for more detailed troubleshooting information:  
[www.hp.com/support](http://www.hp.com/support).

## Caring for cartridges

To ensure the longest possible life for all of your HP DLTtape VS1 data cartridges, follow these guidelines:

- Maintain clean and smoke-free operating and storage environments.
- Do not drop or strike a data cartridge. Excessive shock can displace the tape leader, making the data cartridge unusable and possibly damaging your tape drive.
- Store your data cartridges in their plastic storage cases.
- Do not expose your data cartridges to direct sunlight or sources of heat, including portable heaters and heating ducts.
- The operating temperature range for your data cartridges is 10° C to 40° C (50° F to 104° F). The storage temperature range is 16° C to 32° C (60° F to 90° F).
- If a data cartridge is exposed to temperatures outside the ranges specified above, stabilize the data cartridge at room temperature for the same amount of time it was exposed to extreme temperatures, up to 24 hours.
- Store your data cartridges in a dust-free environment in which relative humidity is always between 20% and 80% (noncondensing). The ideal storage relative humidity is 40%, 20%.
- Do not place data cartridges near sources of electromagnetic energy or strong magnetic fields, such as computer monitors, electric motors, speakers, or X-ray equipment. Exposure to electromagnetic energy or magnetic fields can destroy data on data cartridges.
- Place identification labels only in the slide-in slot on the front of the data cartridge.
- Never use any type of adhesive labels or 'sticky' notes on data cartridges; they can become dislodged inside the tape drive and entangled in the mechanism.
- Do not use graphite pencil, water-soluble felt pens, or other debris-producing writing instruments on your labels. Never erase a label; replace it.

## Other sources of information

You will also find troubleshooting information and contact details on the *HP StorageWorks Tape* CD-ROM and the HP web site. In particular:

- The online User's Guide on the *HP StorageWorks Tape* CD-ROM contains an extensive troubleshooting topic.
- The HP support web site contains a link to [www.hp.com/support/dlt](http://www.hp.com/support/dlt) that takes you to HP's Customer Care web site for a wide range of up-to-date information about your product.
- The HP web site at [www.hp.com/go/connect](http://www.hp.com/go/connect) provides details of recommended products and configurations.

### How to contact HP

You can also use the HP Customer Call Centers for specialist technical help. Contact details can be found at [www.hp.com](http://www.hp.com). Click on the link to "contact HP".

To make the best use of this service, we ask that you work with our Support Specialists to resolve any issues with your drive. This may include downloading diagnostic software, that will assist in the rapid resolution of your problems. If you do not have web access, a full listing of HP Customer Call Centers, correct at time of printing, is given in the online User's Guide on the *HP StorageWorks Tape* CD-ROM.

# Replacing your tape drive

If your tape drive proves to be faulty and cannot be repaired and it is still covered by the original warranty, it will be replaced.

## To disconnect your drive

- 1 Unpack your replacement drive, and retain the packaging.
- 2 Switch off your server and any other devices that are on the same SCSI bus and disconnect them from the power supply.
- 3 Remove the cover from the server, see page 13.
- 4 Observing normal anti-static precautions (see page 13) remove any screws that are holding the tape drive in place.
- 5 Disconnect the drive from the server's power and SCSI cables and slide it carefully out of the mounting bay.
- 6 Put the drive into the packaging that contained the replacement drive.
- 7 Return the faulty drive to your local HP Service Center. Instructions on where to return faulty drives will be shipped with the replacement drive.

**Note** If you are not replacing the drive immediately, you should insert a blanking plate into the empty bay. Replace the cover on the server and secure with screws, as appropriate.

## To reconnect your tape drive

Follow the step-by-step instructions in this Getting Started guide.